US006562480B1

(12) **United States Patent**
Stong et al.

(10) **Patent No.: US 6,562,480 B1**
(45) **Date of Patent: May 13, 2003**

(54) **WEAR RESISTANT COATING FOR PISTON RINGS**

(75) Inventors: **Thomas C. Stong**, Kent City, MI (US); **Peter J. Einberger**, Muskegon, MI (US); **Thomas J. Smith**, Muskegon, MI (US)

(73) Assignee: **Dana Corporation**, Toledo, OH (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 20 days.

(21) Appl. No.: **09/757,891**

(22) Filed: **Jan. 10, 2001**

(51) **Int. Cl.**[7] **C22C 19/05**; B32B 15/00; B32B 15/16; B23P 15/08

(52) **U.S. Cl.** **428/546**; 428/569; 428/660; 428/663; 428/666; 29/888.074

(58) **Field of Search** 428/546, 569, 428/660, 663, 666; 29/888.074

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,556,747	A	1/1971	Hyde et al.	29/198
4,039,399	A	8/1977	Wallace et al.	204/25
4,123,072	A	10/1978	Sharpe	277/216
4,208,845	A	6/1980	Sharpe	51/290
4,334,927	A	6/1982	Hyde et al.	75/240
4,592,964	A	6/1986	Buran et al.	428/610
4,612,256	A	9/1986	Neuhauser et al.	428/547
4,756,841	A	7/1988	Buran et al.	252/26
5,126,104	A	6/1992	Anand et al.	419/12
5,547,203	A	8/1996	Binford	277/224
5,592,927	A	1/1997	Zaluzec et al.	123/668
5,605,741	A	2/1997	Hite et al.	428/216
5,702,769	A	12/1997	Peters	427/451
5,713,129	A	2/1998	Rastegar et al.	29/888.04
5,713,324	A	2/1998	Frame et al.	123/193.6
5,756,150	A	5/1998	Mori et al.	427/197
5,763,106	A	6/1998	Blanchard et al.	428/570
5,773,734	A	6/1998	Young	75/243
5,863,618	A	1/1999	Jarosinski et al.	427/450
5,906,896	A	5/1999	Jackson et al.	428/621

OTHER PUBLICATIONS

Dana Perfect Circle Division Material Specification, No. PCF-284, Issued Jul. 8, 1999.

Dana Perfect Circle Division Material Specification, No. PCHP-2, Issued Jan. 10, 2000.

Primary Examiner—John J. Zimmerman
Assistant Examiner—Jason Savage
(74) *Attorney, Agent, or Firm*—Rader, Fishman & Grauer PLLC

(57) **ABSTRACT**

A wear resistant coating for protecting surfaces undergoing sliding contact is disclosed. The wear resistant coating is applied by high velocity oxygen-fuel (HVOF) deposition of a powdered blend of the coating constituents. The powdered blend includes a nickel-chromium alloy, chromium carbide, and molybdenum. The disclosed coating should find use as a bearing surface on piston rings, cylinder liners, and other components of a power cylinder assembly of an internal combustion engine.

10 Claims, 3 Drawing Sheets